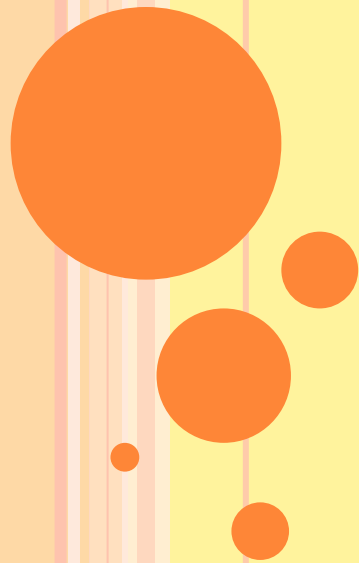
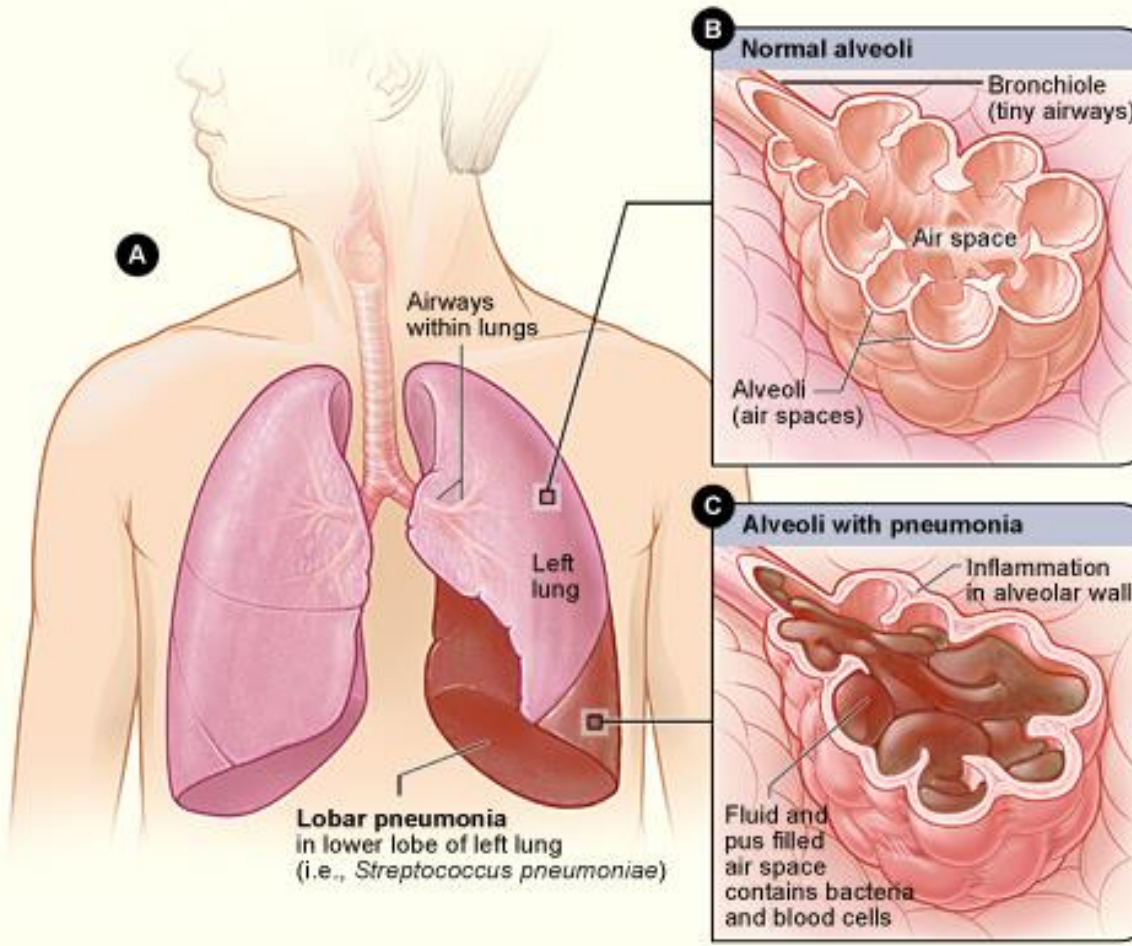


COMMUNITY ACQUIRED PNEUMONIA



Dr. C.D. Kulkarni
MD Pulmonology

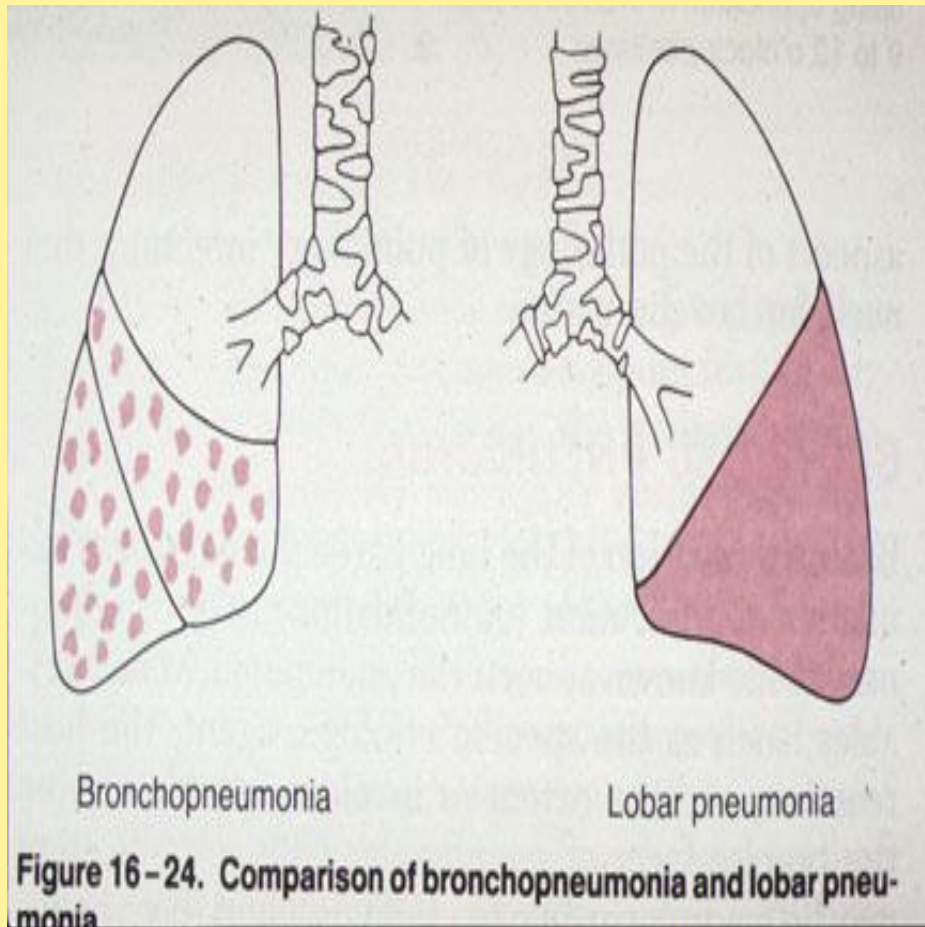
DEFINITION



Inflammation of lung parenchyma lead to consolidation of affected part and filling of alveolar air spaces with exudate, inflammatory cells and fibrin

Type	Definition	Aetiological causes
Community-acquired pneumonia	Pneumonia that develops in the outpatient setting or within 48 hours of admission to a hospital	Strep. Pneumonia Haemophilus Influenzae Moraxella catarrhalis Mycoplasma pneumonia
Hospital-acquired pneumonia	pneumonia that develops in the inpatient setting after 48 hours of admission to a hospital	Gram –ve bacilli (enterobacteriaceae; klebsiella, E.coli) Pseudomonas sp. Anaerobes
Aspiration pneumonia	inhalation of oropharyngeal secretions and colonized organisms	Strep. Pneumonia Anaerobes (bacteroides)
Immunocompromised patient		CMV Pneumocystis jiroveci Mycobacterium avium-intracellulare
Atypical pneumonia		Legionella pneumophila Chlamydophilia sp.

ANATOMIC DISTRIBUTION



Bronchopneumonia

- Patchy inflammation distribution
- Initial infection of bronchi and bronchioles then extend to alveoli

Lobar pneumonia

- Contiguous airspaces of part or all of a lobe
- Homogenously filled with exudate

ETIOLOGY

○ AGENT FACTORS :

Typical pathogens : - Strept pneumoniae
- Haemophilus influenza
- Staph. aureus
- GNB – Kleb Pneumoniae
- Pseud aeruginosa



○ Atypical pathogens :

- Chlamydiaophila pneumoniae
- Mycoplasma pneumoniae
- Legionella spp.
- Respiratory viruses – Influenza

Adeno

RSV



- **Rare pathogens :**

 - Fungi

 - Protozoa

 - New viruses - Hantavirus

 - Metapneumovirus

 - Coronavirus

 - (SARS)

- *Changing trends : MDR strains of GNB and CA – MRSA can cause necrotising pneumonia*



HOST FACTORS

Breach of *mechanical or immunological defences* makes a host susceptible to infection



POSSIBLE ETIOLOGICAL AGENT ACCORDING TO SUSCEPTIBILITY

- Alcoholism - *Klebsiella pneumoniae*, oral anaerobes, *S. pneumoniae*, *M. Tb*
- COPD and/or Smoking – *H. influenza*, *Moraxella catarrhalis*, *Pseudomonas*, *S. pneumoniae*
- Structural lung disease – *Pseud aeruginosa*, *Burkholderia cepacia*, *S. aureus*
- Decreased level of consciousness – Oral anaerobes, gram neg bacilli



PATHOPHYSIOLOGY

- Host defences trigger inflammatory response which lead to clinical syndrome of pneumonia
- Inflammatory mediators from macrophages and neutrophils create *alveolar capillary leak* equivalent to that seen in ARDS.



PATHOLOGY

- Intact immunity or typical pathogen— *Localisation of infection and so lobar pneumonia pattern*

4 Stages : Edema

Red Hepatization- Erythrocytes

Gray Hepatization- neutrophils

Resolution- Macrophages

- Immunocompromised or atypical pathogens—
Bronchopneumonia pattern



CLINICAL MANIFESTATIONS

- CAP can vary from mild diseases to fatal in severity
- **Symptoms** : Cough,
dyspnea,
chestpain (if parietal pleura involved)
Fever,
constitutional symptoms
- Non Respiratory symptoms
Mycoplasma – CNS,
Legionella – Glomerulonephritis, Cerebellar
involvement

SIGNS

- Fever (absent in 20%)
- Crackles
- Physical findings of consolidation (*dullness to percussion, increased tactile, vocal fremitus, whispering pectoriliquey, & bronchial breath sounds*) are present in about 20 percent.
- Pleural friction rub is heard in about 10 percent of cases



DIAGNOSIS

- Clinical
- Radiological
- Etiological : Gram stain and culture of sputum
Blood cultures
Antigen tests
PCR
Serology



DIFFERENTIAL DIAGNOSIS

- Acute exacerbation of COPD
- Heart Failure
- Pulmonary embolism
- Radiation Pneumonitis
- Acute Bronchitis



TREATMENT

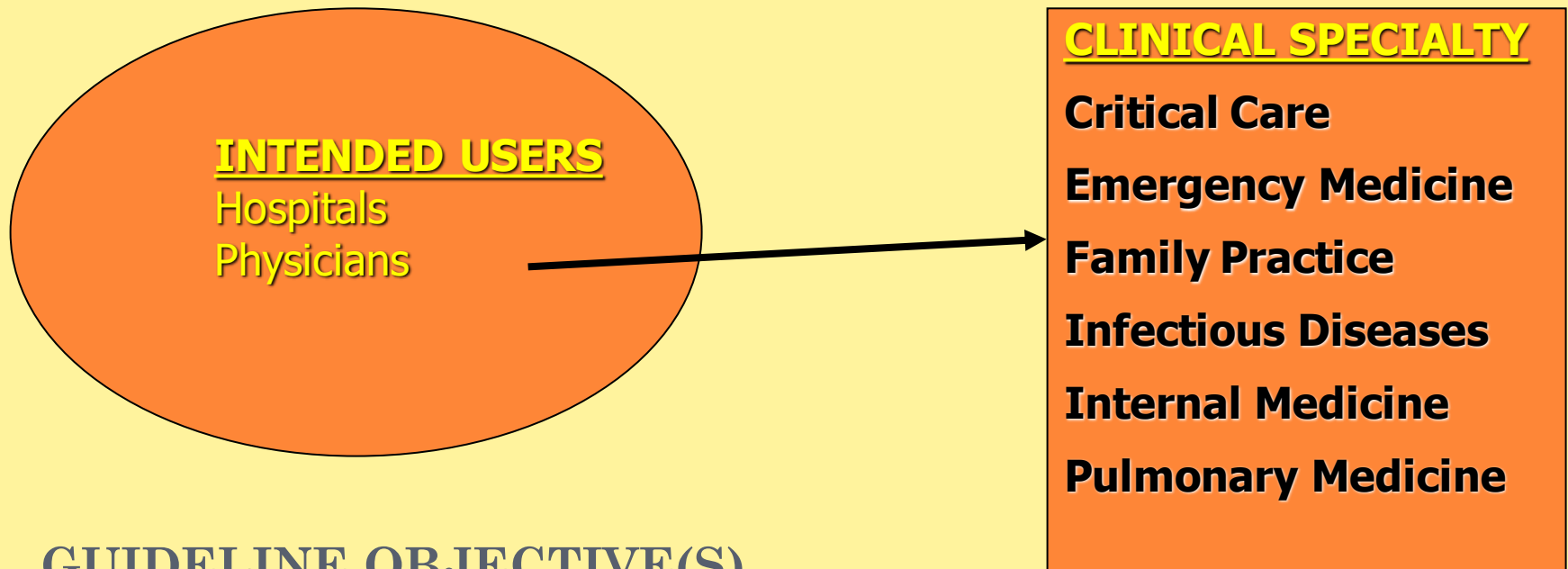
○ AS PER

*Infectious Diseases Society of America/American
Thoracic Society Consensus*

Guidelines on

*Management of Community-Acquired
Pneumonia
in Adults*





GUIDELINE OBJECTIVE(S)

To update clinicians with regard to important
advances and controversies in the management of
patients with CAP

TARGET POPULATION
Adult patients with CAP



The committee chose not to address CAP occurring in

- o Immunocompromised patients including
 - o Transplant recipients
 - o solid organ
 - o bone marrow
 - o stem cell
- o Patients receiving
 - o cancer chemotherapy
 - o long-term (>30 days) high-dose corticosteroid treatment
- o Congenital or Acquired immunodeficiency
- o Infected with HIV with CD4 cell counts <350 cells/mm³
- o Pneumonia in children (≤18 years of age) .



SITE OF CARE DECISION

- CURB-65 SCORE
- PNEUMONIA SEVERITY SCORE



CURB-65

Scoring system to analyze severity of pneumonia (1 point given for presence of each of the following)

Confusion

- Altered mental status

Uremia

- BUN level $>7\text{mmol/L}$

Respiratory rate

- > 30 breath/min

BP

- <90 systolic and/or <60 diastolic

Age

- >65

0-1

- Outpatient treatment

2

- Admission to medical ward

>3

- Admission to ICU/ITU



PSI (Pneumonia Severity Index)

Uses 20 clinical variables to determine a score.

These scores are then used to define five classes of increasing risk of mortality.

- Risk class I and II - treat as outpatients
- Risk class III - treat in an observation unit or with a short hospitalization
- Risk class IV and V - treat as inpatients .

ICU Admission Decision

“Direct admission to an ICU is required for patients with

- ♦ *Septic shock* requiring vasopressors
- ♦ Acute respiratory failure requiring *intubation and mechanical ventilation.*”

(Strong recommendation; level II evidence)



Criteria for *Severe* Community-acquired Pneumonia

Major criteria

1. Invasive mechanical ventilation
2. Septic shock with the need for vasopressors.

Minor criteria

1. Respiratory rate ≥ 30 breaths/min
2. PaO₂/FiO₂ ratio ≤ 250
3. Multi-lobar infiltrates
4. Confusion/disorientation
5. Uremia (BUN level, ≥ 20 mg/dL)
6. Leucopenia (WBC count, < 4000 cells/mm³)
7. Thrombocytopenia (platelet count, $< 100,000$ cells/mm³)
8. Hypothermia (core temperature, < 36 degrees C)
9. Hypotension requiring aggressive fluid resuscitation



Criteria for Severe Community-acquired Pneumonia

- Other criteria to consider includes
 - ◆ Hypoglycemia (in nondiabetic patients),
 - ◆ Acute alcoholism/alcoholic withdrawal,
 - ◆ Hyponatremia,
 - ◆ Unexplained metabolic acidosis or elevated lactate level,
 - ◆ Cirrhosis, and
 - ◆ Asplenia.

- *A need for noninvasive ventilation can substitute for*
 - *a respiratory rate >30 breaths/min or*
 - *a PaO₂/FiO₂ ratio <250.*



Diagnostic Testing

“ For the diagnosis of pneumonia

- Suggestive *clinical* features,
- Demonstrable infiltrate by *CXR* or other imaging technique,
- with or without supporting *microbiological* data

(Moderate recommendation: level III evidence)



Recommended Diagnostic Tests for Etiology

“ Patients with CAP should be investigated for specific pathogens that would significantly alter standard (empirical) management decisions, when the presence of such pathogens is suspected on the basis of clinical and epidemiologic clues”

(Strong recommendation; level II evidence)



Recommended Diagnostic Tests for Etiology

*“Routine diagnostic tests to identify an etiologic diagnosis are **optional for outpatients** with CAP”.*



(Moderate recommendation; level III evidence)

Recommended Diagnostic Tests for Etiology

*“Pretreatment **blood samples** for culture and an **expectorated sputum** sample for stain and culture (in patients with a productive cough) should be obtained from hospitalized patients with the clinical indications but are optional for patients without these conditions. “*

(Moderate recommendation; level I evidence)



Table 5. Clinical indications for more extensive diagnostic testing.

Indication	Blood culture	Sputum culture	<i>Legionella</i> UAT	Pneumococcal UAT	Other
Intensive care unit admission	X	X	X	X	X ^a
Failure of outpatient antibiotic therapy		X	X	X	
Cavitary infiltrates	X	X			X ^b
Leukopenia	X			X	
Active alcohol abuse	X	X	X	X	
Chronic severe liver disease	X			X	
Severe obstructive/structural lung disease		X			
Asplenia (anatomic or functional)	X			X	
Recent travel (within past 2 weeks)			X		X ^c
Positive <i>Legionella</i> UAT result		X ^d	NA		
Positive pneumococcal UAT result	X	X		NA	
Pleural effusion	X	X	X	X	X ^e

NOTE. NA, not applicable; UAT, urinary antigen test.

^a Endotracheal aspirate if intubated, possibly bronchoscopy or nonbronchoscopic bronchoalveolar lavage.

^b Fungal and tuberculosis cultures.

^c See table 8 for details.

^d Special media for *Legionella*.

^e Thoracentesis and pleural fluid cultures.

Recommended Diagnostic Tests for Etiology

“Pretreatment Gram stain and culture of expectorated sputum should be performed only if a good-quality specimen can be obtained and quality performance measures for collection, transport, and processing of samples can be met.”

(Moderate recommendation; level II evidence)



Recommended Diagnostic Tests for Etiology

“Patients with severe CAP, should at least have

- Blood culture,
- Urinary antigen tests for *Legionella pneumophila* and *Streptococcus pneumoniae*
- Sputum for culture. (For intubated patients, an endotracheal aspirate sample.)”

(Moderate recommendation; level II evidence)



Most common etiologies of community-acquired pneumonia.

Patient type

Etiology

○ Outpatient

Streptococcus pneumoniae

Mycoplasma pneumoniae

Haemophilus influenzae

Chlamydophila pneumoniae

Respiratory viruses^a

○ Inpatient (non-ICU)

S. pneumoniae

M. pneumoniae

C. pneumoniae

H. influenzae

Legionella species

Aspiration

Respiratory viruses^a

○ Inpatient (ICU)

S. pneumoniae

Staphylococcus aureus

Legionella species

Gram-negative bacilli

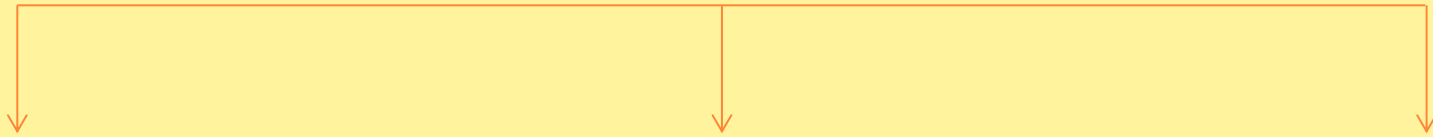
H. influenzae



○ TREATMENT



OUTPATIENT



Previously healthy
no use of antimicrobials
In previous 3 months high-level



MACROLIDE

OR

DOXYCYCLINE

Presence of comorbidities



RESP FLOUROQUINOLONES

OR

B-LACTUM + MACROLIDE

high rate of infection with
macrolide-resistant
Strep pneumoniae



B LACTUMS
(*other alternatives*)

AND

DOXYCYCLINE

Empirical Antimicrobial Therapy

Outpatient Treatment

“Previously healthy and no use of antimicrobial in last 3 months”

A ***macrolide*** (azithromycin, clarithromycin, erythromycin)

(Strong recommendation; level I evidence)

OR

Doxycycline

(Weak recommendation; level III evidence)



Outpatient Treatment

“Presence of comorbidities

A respiratory fluoroquinolone
(moxifloxacin, gemifloxacin, or levofloxacin
[750 mg])

(Strong recommendation; level I evidence)

OR

A beta- lactam plus a macrolide

(Strong recommendation; level I evidence)

(High-dose amoxicillin [e.g., 1 g 3 times daily] or amoxicillin-clavulanate [2 g 2 times daily] is preferred; alternatives include ceftriaxone, cefpodoxime, and cefuroxime [500 mg 2 times daily]; Doxycycline is an alternative to the macrolide)”

(level II evidence)

Comorbidities

1. Chronic heart, lung, liver, or renal disease
2. Diabetes mellitus
3. Alcoholism
4. Malignancies
5. Asplenia
6. Immunosuppressing conditions
7. Use of immunosuppressing drugs
8. Use of antimicrobials within the previous 3 months (in which case an alternative from a different class should be selected)
9. Other risks for DRSP infection



IN-PATIENTS

NON ICU PATIENTS
PATIENTS

- RESP FLOUROQUINOLONES (FQ)
OR
B-LACTUM + MACROLIDE

ICU

B-LACTUM
AND
AZITHRO/ RESP FQ

(If allergic to penicillin ,
Resp FQ and Aztreonem)



Empirical Antimicrobial Therapy

Inpatient, ICU Treatment

“**A beta-lactam** (cefotaxime, ceftriaxone, or ampicillin-sulbactam)

plus

Azithromycin

(level II evidence)

OR

fluoroquinolone

(level I evidence)



Empirical Antimicrobial Therapy

Inpatient, ICU Treatment

“For *Pseudomonas* infection

An antipneumococcal, antipseudomonal beta-lactam
(piperacillin-tazobactam, cefepime, imipenem, or meropenem)
plus
Either ciprofloxacin or levofloxacin (750-mg dose)

or
above beta-lactam + aminoglycoside + azithromycin

or
above beta-lactam + aminoglycoside + antipneumococcal
fluoroquinolone (moxifloxacin, gemifloxacin, or levofloxacin)

*(for penicillin-allergic patients, substitute aztreonam for the above
beta-lactam). “*

(Moderate recommendation; level III evidence)



Empirical Antimicrobial Therapy

Inpatient, ICU Treatment

“For community-acquired methicillin-resistant *Staphylococcus aureus* (CA-MRSA) infection, add *vancomycin or linezolid*.”

(Moderate recommendation; level III evidence)



Pathogen-directed Therapy

“Once the etiology of CAP has been identified on the basis of reliable microbiological methods, antimicrobial therapy should be directed at that pathogen”

(Moderate recommendation; level III evidence)



Organism	Preferred antimicrobial(s)	Alternative antimicrobial(s)
<i>Streptococcus pneumoniae</i>		
Penicillin nonresistant; MIC ≤ 2 μ g/mL	Penicillin G, amoxicillin	Macrolide, cephalosporins (oral [cefprozime, cefprozil, cefuroxime, cefdinir, cefditoren] or parenteral [cefuroxime, ceftriaxone, cefotaxime]), clindamycin, doxycycline, respiratory fluoroquinolone ^a
Penicillin resistant; MIC ≥ 2 μ g/mL	Agents chosen on the basis of susceptibility, including cefotaxime, ceftriaxone, fluoroquinolone	Vancomycin, linezolid, high-dose amoxicillin (3 g/day with penicillin MIC ≤ 4 μ g/mL)
<i>Haemophilus influenzae</i>		
Non- β -lactamase producing	Amoxicillin	Fluoroquinolone, doxycycline, azithromycin, clarithromycin ^b
β -Lactamase producing	Second- or third-generation cephalosporin, amoxicillin-clavulanate	Fluoroquinolone, doxycycline, azithromycin, clarithromycin ^b
<i>Mycoplasma pneumoniae/Chlamydophila pneumoniae</i>	Macrolide, a tetracycline	Fluoroquinolone
<i>Legionella</i> species	Fluoroquinolone, azithromycin	Doxycycline
<i>Chlamydophila psittaci</i>	A tetracycline	Macrolide
<i>Coxiella burnetii</i>	A tetracycline	Macrolide
<i>Francisella tularensis</i>	Doxycycline	Gentamicin, streptomycin
<i>Yersinia pestis</i>	Streptomycin, gentamicin	Doxycycline, fluoroquinolone
<i>Bacillus anthracis</i> (inhalation)	Ciprofloxacin, levofloxacin, doxycycline (usually with second agent)	Other fluoroquinolones; β -lactam, if susceptible; rifampin; clindamycin; chloramphenicol
Enterobacteriaceae	Third-generation cephalosporin, carbapenem ^c (drug of choice if extended-spectrum β -lactamase producer)	β -Lactam/ β -lactamase inhibitor, ^d fluoroquinolone
<i>Pseudomonas aeruginosa</i>	Antipseudomonal β -lactam ^e plus (ciprofloxacin or levofloxacin ^f or aminoglycoside)	Aminoglycoside plus (ciprofloxacin or levofloxacin ^f)
<i>Burkholderia pseudomallei</i>	Carbapenem, ceftazadime	Fluoroquinolone, TMP-SMX
<i>Acinetobacter</i> species	Carbapenem	Cephalosporin-aminoglycoside, ampicillin-sulbactam, colistin
<i>Staphylococcus aureus</i>		
Methicillin susceptible	Antistaphylococcal penicillin ^g	Cefazolin, clindamycin
Methicillin resistant	Vancomycin or linezolid	TMP-SMX
<i>Bordetella pertussis</i>	Macrolide	TMP-SMX
Anaerobe (aspiration)	β -Lactam/ β -lactamase inhibitor, ^d clindamycin	Carbapenem
Influenza virus	Oseltamivir or zanamivir	
<i>Mycobacterium tuberculosis</i>	Isoniazid plus rifampin plus ethambutol plus pyrazinamide	Refer to [243] for specific recommendations
<i>Coccidioides</i> species	For uncomplicated infection in a normal host, no therapy generally recommended; for therapy, itraconazole, fluconazole	Amphotericin B
Histoplasmosis	Itraconazole	Amphotericin B
Blastomycosis	Itraconazole	Amphotericin B

Pathogen-directed Therapy

“For influenza A”

Early treatment (within 48 h of the onset of symptoms) with

oseltamivir or zanamivir is recommended.”

(Strong recommendation; level I evidence)



- **Neuraminidase inhibitors.**
- **They help prevent influenza A and influenza B viruses from multiplying in the body by interfering with the production and release of virus from cells that line the respiratory tract.**
- **This may slow the spread of the infection within the airways and lungs.**
- **Oseltamivir is taken as a pill twice each day for 5 days.**
- **Zanamivir is inhaled through a device Diskhaler**

Pathogen-directed Therapy

“Use of oseltamivir and zanamivir is not recommended for patients with uncomplicated influenza with symptoms for >48 h (level I evidence) , but these drugs may be used to reduce viral shedding in hospitalized patients or for influenza pneumonia. “

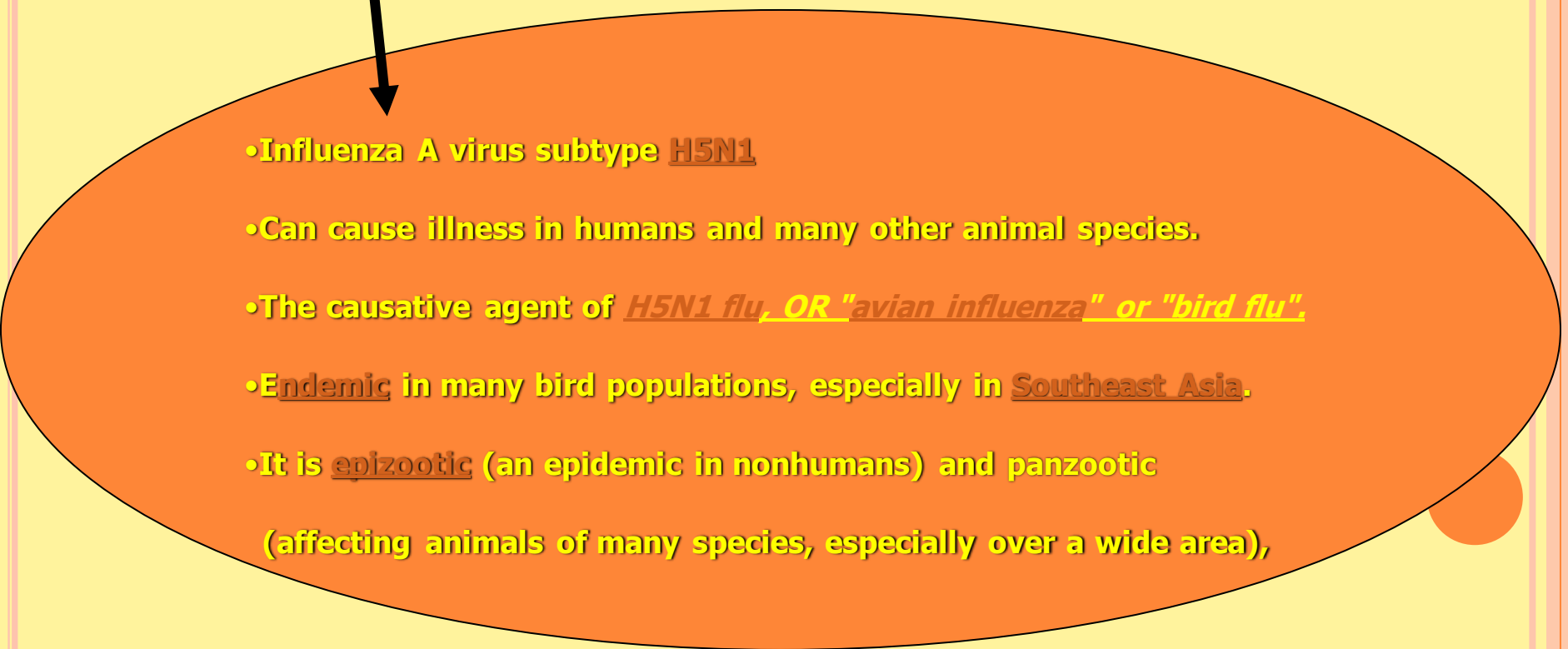
(Moderate recommendation; level III evidence)



Pandemic Influenza

“Patients with an illness compatible with influenza and with known exposure to poultry in areas with previous H5N1 infection should be tested for H5N1 infection.”

(Moderate recommendation; level III evidence)

- 
- Influenza A virus subtype H5N1
 - Can cause illness in humans and many other animal species.
 - The causative agent of H5N1 flu, OR "avian influenza" or "bird flu".
 - Endemic in many bird populations, especially in Southeast Asia.
 - It is epizootic (an epidemic in nonhumans) and panzootic (affecting animals of many species, especially over a wide area),

In patients with suspected H5N1 infection, droplet precautions and careful routine infection control measures should be used until an H5N1 infection is ruled out.

(Moderate recommendation; level III evidence)



“Patients with **suspected H5N1** infection should be treated with oseltamivir **(level II evidence)** and antibacterial agents targeting *S. pneumoniae* and *Staph. aureus* (the most common causes of secondary bacterial pneumonia in patients with influenza.) ”

(Moderate recommendation; level III evidence)



Time to First Antibiotic Dose

“For patients admitted through the emergency department (ED), the first antibiotic dose should be administered while still in the ED. “

(Moderate recommendation; level III evidence)

- ✧ The committee did not feel that a specific time window for delivery of the first antibiotic dose should be recommended.
- ✧ Preferably within the first 4–8 hrs



Criteria for Clinical Stability

1. Temperature ≤ 37.8 degrees C
2. Heart rate ≤ 100 beats/min
3. Respiratory rate ≤ 24 breaths/min
4. Systolic blood pressure ≥ 90 mm Hg
5. Arterial oxygen saturation $\geq 90\%$ or $pO_2 \geq 60$ mm Hg on room air
6. Ability to maintain oral intake*
7. Normal mental status*

**Important for discharge or oral switch decision but not necessarily for determination of nonresponse.*



Switch from Intravenous to Oral Therapy

“Patients should be switched from I.V. to oral therapy when

- Hemo - dynamically stable
- Improving clinically,
- Able to ingest medications,
- Have a normally functioning gastrointestinal tract. “

(Strong recommendation; level II evidence)



“Patients should be **discharged** as soon as

- Clinically stable,
- No other active medical problems
- Have a safe environment for continued care.

Inpatient observation while receiving oral therapy is not necessary. “

(Moderate recommendation; level II evidence)



Duration of Antibiotic Therapy

- A minimum of 5 days (level I evidence),
- Should be afebrile for 48 to 72 h, and
- Should have no more than 1 CAP-associated sign of clinical instability before discontinuation of therapy.”

(level II evidence) (Moderate recommendation)



Duration of Antibiotic Therapy

“A longer duration of therapy may be needed if initial therapy was not active against the identified pathogen or if it was complicated by extrapulmonary infection, such as meningitis or endocarditis.”

(Weak recommendation; level III evidence)



OTHER CONSIDERATIONS

- Patients with **hypoxemia or respiratory distress** should receive a **cautious** trial of noninvasive ventilation (NIV) unless they require immediate intubation because of severe hypoxemia (arterial oxygen pressure/fraction of inspired oxygen [PaO₂/FiO₂] ratio < 150) and bilateral alveolar infiltrates.

(Moderate recommendation; level I evidence.)



Table 11. Patterns and etiologies of types of failure to respond.

Failure to improve

Early (<72 h of treatment)

Normal response

Delayed

Resistant microorganism

Uncovered pathogen

Inappropriate by sensitivity

Parapneumonic effusion/empyema

Nosocomial superinfection

Nosocomial pneumonia

Extrapulmonary

Noninfectious

Complication of pneumonia (e.g., BOOP)

Misdiagnosis: PE, CHF, vasculitis

Drug fever

Deterioration or progression

Early (<72 h of treatment)

Severity of illness at presentation

Resistant microorganism

Uncovered pathogen

Inappropriate by sensitivity

Metastatic infection

Empyema/parapneumonic

Endocarditis, meningitis, arthritis

Inaccurate diagnosis

PE, aspiration, ARDS

Vasculitis (e.g., SLE)

Delayed

Nosocomial superinfection

Nosocomial pneumonia

Extrapulmonary

Exacerbation of comorbid illness

Intercurrent noninfectious disease

PE

Myocardial infarction

Renal failure

NOTE. ARDS, acute respiratory distress syndrome; BOOP, bronchiolitis obliterans organizing pneumonia; CHF, congestive heart failure; PE, pulmonary embolus; SLE, systemic lupus erythematosus.

MANAGEMENT O F NON RESOLVING PNEUMONIA

- Transfer to a higher level of care
- Further diagnostic testing
- Escalation / change in treatment
- Others : Chest CT scan
Bronchoscopy
Thoracocentesis



Prevention

Health care workers in inpatient and outpatient settings and long-term care facilities should receive **annual influenza immunization.**

(Strong recommendation; level I evidence.)

“Pneumococcal polysaccharide vaccine is recommended for persons ≥ 65 years of age and for those with selected high-risk concurrent diseases”
(level II evidence)



Prevention

“ Following persons should receive inactivated influenza vaccine.”

- ♦ All persons ≥ 50 years of age
- ♦ Others at risk for influenza complications
- ♦ Household contacts of high-risk persons
- ♦ Health care workers

(Strong recommendation; level I evidence)



Table 13. Recommendations for vaccine prevention of community-acquired pneumonia.

Factor	Pneumococcal polysaccharide vaccine	Inactivated influenza vaccine	Live attenuated influenza vaccine
Route of administration	Intramuscular injection	Intramuscular injection	Intranasal spray
Type of vaccine	Bacterial component (polysaccharide capsule)	Killed virus	Live virus
Recommended groups	All persons ≥ 65 years of age High-risk persons 2–64 years of age Current smokers^b	All persons ≥ 50 years of age High-risk persons 6 months–49 years of age Household contacts of high-risk persons Health care providers Children 6–23 months of age	Healthy persons 5–49 years of age,^a including health care providers and household contacts of high-risk persons
Specific high-risk indications for vaccination	Chronic cardiovascular, pulmonary, renal, or liver disease Diabetes mellitus Cerebrospinal fluid leaks Alcoholism Asplenia Immunocompromising conditions/medications Native Americans and Alaska natives Long-term care facility residents	Chronic cardiovascular or pulmonary disease (including asthma) Chronic metabolic disease (including diabetes mellitus) Renal dysfunction Hemoglobinopathies Immunocompromising conditions/medications Compromised respiratory function or increased aspiration risk Pregnancy Residence in a long-term care facility Aspirin therapy in persons ≤ 18 years of age	Avoid in high-risk persons
Revaccination schedule	One-time revaccination after 5 years for (1) adults ≥ 65 years of age, if the first dose is received before age 65 years; (2) persons with asplenia; and (3) immunocompromised persons	Annual revaccination	Annual revaccination

NOTE. Adapted from the Advisory Committee on Immunization Practices, Centers for Disease Control and Prevention [304].

^a Avoid use in persons with asthma, reactive airways disease, or other chronic disorders of the pulmonary or cardiovascular systems; persons with other underlying medical conditions, including diabetes, renal dysfunction, and hemoglobinopathies; persons with immunodeficiencies or who receive immunosuppressive therapy; children or adolescents receiving salicylates; persons with a history of Guillain-Barré syndrome; and pregnant women.

^b Vaccinating current smokers is recommended by the Pneumonia Guidelines Committee but is not currently an indication for vaccine according to the Advisory Committee on Immunization Practices statement.

THANK YOU

